

AD-A016 895

AN ANALYSIS OF CONSUMER NUTRITION IN THE EXPERIMENTAL
FOOD SERVICE SYSTEM AT TRAVIS AIR FORCE BASE

John R. Wetmiller, et al

Army Natick Development Center
Natick, Massachusetts

January 1975

DISTRIBUTED BY:

NTIS

National Technical Information Service
U. S. DEPARTMENT OF COMMERCE

317086

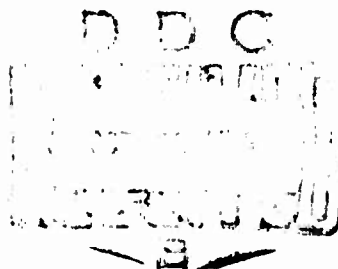
AD 16895

AD

TECHNICAL REPORT

75-70-OR/SA

**AN ANALYSIS OF CONSUMER NUTRITION
IN THE EXPERIMENTAL FOOD SERVICE
SYSTEM AT TRAVIS AFB**



Approved for public release;
distribution unlimited.

January 1975

**UNITED STATES ARMY
NATICK DEVELOPMENT CENTER
NATICK, MASSACHUSETTS 01760**



Reproduced by
NATIONAL TECHNICAL
INFORMATION SERVICE
U.S. Department of Commerce
Springfield, VA. 22151

**Operations Research and Systems
Analysis Office**

47

ACCESSION INT	
NTIS	Write Section <input checked="" type="checkbox"/>
DDC	Buff Section <input type="checkbox"/>
UNANNOUNCED	<input type="checkbox"/>
JUSTIFICATION	
BY	
DISTRIBUTION AVAILABILITY CODES	
Dist.	Avail. Code or Special
A	

Approved for public release; distribution unlimited.

Citation of trade names in this report does not constitute an official indorsement or approval of the use of such items.

Destroy this report when no longer needed. Do not return it to the originator.

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER 75-70-OR/SA	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) AN ANALYSIS OF CONSUMER NUTRITION IN THE EXPERIMENTAL FOOD SERVICE SYSTEM AT TRAVIS AFB		5. TYPE OF REPORT & PERIOD COVERED
7. AUTHOR(s) John R. Wetmiller and T. T. Mattus, Jr.		6. PERFORMING ORG. REPORT NUMBER
9. PERFORMING ORGANIZATION NAME AND ADDRESS U.S. Army Natick Development Center Natick, Massachusetts 01760		8. CONTRACT OR GRANT NUMBER(s)
11. CONTROLLING OFFICE NAME AND ADDRESS Operations Research and Systems Analysis Office U.S. Army Natick Development Center Natick, Massachusetts 01760		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 6.2 1J662713AF45, Task 03
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		12. REPORT DATE January 1975
		13. NUMBER OF PAGES 44
		15. SECURITY CLASS. (of this report)
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report) Approved for public release; distribution unlimited.		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES Service Requirement Identification: AF 3-19 - Food Service Systems Analysis		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number)		
Evaluation Analysis Food Food Service	Performance Menu Food Service Systems Acceptability	Food Preferences Requirements Feeding Requirements Consumers Consumer Acceptability Food Cost Labor Cost Nutrition
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) An experiment was conducted at Travis AFB to evaluate proposed improvements to Air Force food service operations. The experiment included the introduction of three new military food service concepts which affected both customer eating habits and attendance patterns. This report provides a detailed evaluation of the nutritional adequacy of the experimental system. It is concluded that all nutritional requirements are satisfied, and that the total system is even more nutritionally effective because customer utilization and attendance were significantly increased.		

DD FORM 1473

EDITION OF 1 NOV 65 IS OBSOLETE

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

PREFACE

This study was accomplished with the valued assistance and diligent efforts of several members of the Operations Research and Systems Analysis Office at the U.S. Army Natick Development Center. In particular, Mr. Mark M. Davis, Mr. Harry Kirejczyk, and Dr. D. P. Leitch participated in the difficult and time consuming task of collecting and reducing the actual data. Also, Dr. Robert J. Byrne provided considerable guidance in determining the make-up and structure of the report's final form.

TABLE OF CONTENTS

	Page
Introduction	4
Methodology	5
Total System	7
A. Typical Meal Nutrition	7
B. Daily Customer Nutrition by Ration Status	9
C. Customer Nutrition by Ration Status and Residence Location	10
1. All Potential System Users	10
2. Actual System Users	11
3. Actual System Users by Usage Rates	14
4. Actual System Users on Any Given Day	14
An Analysis of Individual Consumer Behavior	18
Customers Changing Ration Status	25
An Analysis of the Three New Food Service Operations and the Standard Dining Hall Meals	25
Results and Conclusions	30
References	33
Appendix A — Utilization Rates for Different Customer Groups	34
Appendix B — Average Food Cost and Nutrient Value Distributions for Individual Consumer Groups	36

LIST OF TABLES

	Page
Table 1. Average Food Costs and Nutrient Values for Different Types of Meals	6
Table 2. Average Food Costs and Nutrient Values for All Potential System Users	12
Table 3. Average Food Costs and Nutrient Values for Actual System Users	13
Table 4. Average Food Costs and Nutrient Values for Actual System Users By Usage Rates	15
Table 5. Average Food Costs and Nutrient Values for Actual System Users on Any Given Day	16
Table 6. Average Food Costs and Nutrient Values for Customer Changing Ration Status	26
Table 7. Average Food Costs and Nutrient Values for Attendance Patterns of the Three New Food Service Operations and of the Standard Dining Hall Meals	27

INTRODUCTION

During FY 1973-74, the U.S. Army Natick Development Center conducted an investigation of Air Force food service under Task 03, Project No. 1J662713AJ45, Analysis and Design of Military Feeding Systems, of the DoD Food Research, Development, Testing and Engineering Program. The purpose of this effort was to define, develop, and evaluate broad improvements to the current Air Force food service operations. In particular, the objectives were to obtain higher levels of consumer participation; i.e., attendance and utilization of the dining facilities, and to increase system performance and effectiveness, within existing cost and operational constraints.

Travis Air Force Base, California, was selected for the principal study site, as best representing the characteristics of Air Force food service. Following the initial studies at Travis AFB, which identified the major problem areas in food service requiring improvements, a number of proposed changes were actually implemented and evaluated in an experiment between 1 November 1973 - 31 January 1974. Since these changes included modifications to the Air Force Worldwide Menu and three new food service operations, which affected both customer eating habits and attendance patterns, the nutritional adequacy of the experimental system was a matter of concern. Descriptions of the new food service operations and their performance, including analysis of consumer attendance, are contained in references 1, 2, and 3.

In general, this report considers the combined effects of the changes in the menus and the alterations in the eating habits and attendance behavior of the system customers. Specifically, the report covers: (1) the calculated nutritional values of the food items on the average customer's tray at the typical meal for periods both before and during the experiment; (2) the average customer's daily nutrition as calculated by considering both the food items on his or her tray and his or her daily attendance rates for periods both before and during the experiment; (3) daily customer nutrition by ration status and residence location groups during the experiment for the entire Travis population; (4) the statistical distributions of daily customer nutrition by ration status and residence location group for an 18-day period in January 1974 for a randomly selected sample of the Travis population; (5) daily nutrition for those customers (both as RIK¹ and as BAS² customers) who changed ration status from RIK to BAS during the experiment; and (6) average nutrition for those daily attendance patterns that include at least one meal at one of the three new food services or that include only standard dining hall meals.

¹ RIK, (rations-in-kind) designates those individuals entitled to use appropriated fund dining facilities without reimbursing the Government.

² BAS, (basic allowance for subsistence) designates those individuals required to pay for any meals eaten in the dining facilities.

METHODOLOGY

During the experiment, individual daily attendance patterns and food selection data were collected for the customers in the various facilities. As reported in reference 4, a sampling plan was designed to account for each meal period in all five dining facilities and to accurately reflect differences in the menus, number of meals served, operating hours, and other relevant factors. The sample sizes actually obtained for each type of meal served are noted below:

Breakfast	962
Dinner	4118
Supper	2292
Specialty Meal	296
Midnight Meal	331
Flight Line Facility	496
Modular Unit	267
	<hr/> 8762

For each randomly selected customer sampled at a meal, the particular food items chosen by the customer were recorded. Nutritional values and costs were calculated for each food item using the Armed Forces Recipe Service formulations (reference 5), USDA Handbook No. 8 Food Composition Data (reference 6), and the Federal supply Catalog Price List for Subsistence (reference 7). Then these values were summed over all food items comprising a single meal and averaged over all meals of the same type. The results of this analysis are presented in Table 1. Since the data base has been updated to reflect more recent recipe and nutrition information, the values may be somewhat different than those that were reported in reference 4.

A source data collection system was installed in the dining facilities during the experiment, which provided a means for collecting attendance data on each customer. Complete records for all persons attending meals in every dining facility were obtained for 50 days of the experiment, which provided the data base for determining the daily attendance patterns.

Given that a person attended certain meals on any one day and the average costs and nutritional values associated with those meals, then the total food costs and nutritional values for that day could be determined. If, for example, a customer attended breakfast and supper on a particular day, then the total average food costs for the day as represented by the food items selected for the two meals would have been \$1.11 (i.e., \$0.37 for breakfast and \$0.74 for supper, as shown in Table 1.). Similarly, the total average food energy value would have been 1957.3 calories, and so forth. These data (average daily cost and nutritional estimates) are presented and analyzed, in subsequent portions of this report, in terms of customer ration status and residency for both the total system customer and for specific population subgroups utilizing the various dining facility services.

TABLE 1
AVERAGE FOOD COSTS AND NUTRIENT VALUES
FOR DIFFERENT TYPES OF MEALS

	Cost (\$)	Food Energy (Cal)	Protein (g)	Fat (g)	Calcium (mg)	Iron (mg)	Vitamin A (IU)	Thiamine (mg)	Riboflavin (mg)	Niacin (mg)	Ascorbic Acid (mg)
Breakfast	0.37	845.5	35.0	43.4	392.9	5.48	1258.5	0.62	0.80	4.74	38.46
Dinner	0.66	1212.1	55.2	49.3	463.7	8.26	2900.3	0.99	0.91	11.65	51.10
Supper	0.74	1111.8	50.0	45.7	374.8	7.50	2826.8	1.04	0.83	11.04	45.80
Specialty Meal	0.72	1192.3	62.9	43.7	585.5	9.36	3112.1	1.06	0.96	11.89	51.99
Midnight Meal	0.40	927.6	39.2	47.9	469.6	5.86	1348.1	0.71	0.90	5.63	50.96
Flight Line Facility	0.75	1463.6	65.4	74.1	584.3	9.77	2408.5	1.03	1.16	12.05	56.37
Modular Unit	0.51	1154.1	51.0	47.1	412.1	6.61	937.4	0.87	0.85	11.99	36.95

Additionally, this report includes an analysis of attendance, nutrition, and food costs for a randomly selected sample of 861 potential system users during an 18-day period in January 1974. Whereas the above-mentioned ration status/residence group analysis utilized average meal cost and nutritional values, this simulation selected meals at random of the proper type (as determined by each customer's daily attendance pattern) to establish the desired cost and nutritional profile distributions.

In total, five different methods of analyzing the nutrition data are used:

- (1) the average calculated nutritional value for all food items on a typical tray among the different types of meals offered at the Travis Air Force Base food outlets;
- (2) the average daily nutritional values for all tray food items of the average RIK and BAS customers taking into consideration their daily attendance patterns;
- (3) the average daily nutrition from selected tray food items of the total Travis population as delineated by ration status and residency;
- (4) the proportion of customers (as segmented by ration status and residency), based on the randomly selected sample of potential system users, receiving the various levels of calculated daily nutrition as represented by their tray food items (e.g., 77 customers from a total potential sample population of 861 customers, or 8.9 percent, received on the average between 0 and 5 percent of the food energy DDA¹ of 3400 calories; and
- (5) the average daily nutrition received from those daily attendance patterns that include at least one meal from one of the three new food service operations or that include only standard dining hall meals.

TOTAL SYSTEM

A. Typical Meal Nutrition

The average food cost and nutritional levels of the typical dining facility meal at Travis AFB both before and during the food service system experiment are considered here. As discussed fully in reference 8, the Office of Institutional Educational Research, University of Washington, Seattle, Washington, administered survey interviews to individual customers in the dining facilities both before (from 12 27 July 1973) and during (from 26 November — 10 December 1973) the experiment. On each survey was noted the actual food items that appeared on the interviewee's tray from which a determination as to the total cost and nutritional value of the meal was obtained using the reference texts earlier mentioned.

¹DDA — Daily dietary allowances for male personnel as prescribed by AFR No. 160-95, Medical Services Nutritional Standards, 10 August 1972.

From this information, calculations as to the typical meal with respect to cost and nutritional levels both before and during the experiment were made. These data are presented below in absolute terms and as a percent of the established nutritional requirements, as specified by the daily dietary allowances (DDA) and the basic daily food allowance (BDFA). In this instance, the BDFA amount was determined for the price list used to calculate the results, whereas it actually varied each month of the experiment. The differences, however, are relatively insignificant. The DDA and BDFA values are provided below, as they are throughout the report, for ease of comparison.

Component	Standard	Pre Experiment		Experiment	
		Value	% Standard	Value	% Standard
Cost	\$2.24	0.61	27.2	0.59	26.3
Food Energy	3400 Cal	1217.0	35.8	1129.6	33.2
Protein	100 g	53.8	53.8	51.2	51.2
Fat	<152 g	53.8	35.4	50.2	33.0
Calcium	800 mg	520.4	65.0	469.0	58.6
Iron	14 mg	7.96	56.9	7.6	53.9
Vitamin A	5000 IU	2748.5	55.0	2114.0	42.3
Thiamine	1.7 mg	0.94	55.3	0.90	52.9
Riboflavin	2.0 mg	0.94	47.0	0.92	46.0
Niacin	22 mg	10.08	45.8	9.86	44.8
Ascorbic Acid	60 mg	52.94	88.2	47.38	79.0

For every nutritional component there was a decrease in the amount contained in the typical dining facility served meal from the pre-experimental to the experimental period. This, however, is not considered surprising when it is remembered that during the experiment a concerted effort was made to serve high preference food items. It should be noted additionally that, even with the decrease, all nutritional component values except food energy complied with the DDA/3 nutritional level for the typical meal during the experiment. The fact that the food energy nutrient level was marginally below the DDA/3

level presents no nutritional problem. Because overweight is considered more of a problem than underweight, a caloric shortage should not be of concern especially since all other nutrient levels comply with the DDA/3 standard.

B. Daily Customer Nutrition By Ration Status

By utilizing the headcount attendance and the present for duty enlisted strength data it was possible to determine both the RIK (rations-in-kind) and BAS (basic allowance for subsistence) meals/person/day utilization rates for the pre-experimental and the experimental periods. Using this in conjunction with the cost and nutrient component data for RIK and BAS meals during both periods, as supplied by the University of Washington survey interview data, the average daily per person cost and nutritional characteristics were determined as presented below:

Component	Standard	Before	RIK After	% Increase	Before	BAS After	% Increase
Cost	\$2.24	0.46	0.63	37.0	0.06	0.07	16.7
Food Energy	3400 Cal	900.4	1179.8	31.0	110.6	123.4	16.1
Protein	100 g	39.6	54.0	36.4	4.9	5.9	20.4
Fat	<152 g	39.8	51.1	28.4	4.9	5.7	16.3
Calcium	800 mg	378.5	479.5	26.7	46.5	51.6	11.0
Iron	14 mg	5.78	7.82	35.3	0.71	0.88	23.9
Vitamin A	5000 IU	2019.6	2390.0	18.3	248.2	266.2	7.3
Thiamine	1.7 mg	0.70	0.91	30.0	0.09	0.10	11.1
Riboflavin	2.0 mg	0.70	0.96	37.1	0.09	0.10	11.1
Niacin	22 mg	7.38	10.58	43.4	0.91	1.13	24.2
Ascorbic Acid	60 mg	40.35	52.56	30.3	4.96	5.55	11.9
Nutrient Average				31.7			15.3

As can be readily noted, all the daily per person cost and nutrient component levels increased markedly for both RIK and BAS personnel. Given the information presented in the preceding section, it is obvious that these increases were due to higher food service system utilization rates. From the pre-experiment months to the experimental period the meals/person/day figures for RIK and BAS personnel increased by 37.3% and 17.0% respectively.

C. Customer Nutrition By Ration Status and Residence Location

An analysis of the attendance data on 50 days during the experimental period indicated that attendance patterns (i.e., meal-by-meal utilization rates) varied not only as a function of ration status but also with respect to whether the person resided in a dormitory, elsewhere on Base, or in housing located off the Base. By appropriate calculations involving (1) the meal/person/day rates, (2) the meal-by-meal utilization rates (see Appendix A), and (3) the average costs and nutrient values for each type of meal (see Table I), a determination was made as to the average daily food cost and nutrition for each of the ration status/residence location consumer groups.

1. All Potential System Users

All potential system users included all enlisted personnel at Travis whether they ever used the military system of food service or not during the experiment. The meals/person/day rates, and therefore the daily food costs and nutritional levels as well, are obviously a function of the population being considered. Table 2 presents the food cost and nutritional data using all potential system users (i.e., the average monthly present for duty enlisted strength) as the system population. Also shown are the percentages of the BDFA and DDA standards that the food cost and nutritional values represent. Shown in parenthesis under the meals/person/day utilization figures are the percentages that relate those figures on a percentage basis to a three meal per person per day standard. For example, in the "Total" row the average system customer attended 0.35 meals per day or 11.7% of three meals per day. Therefore, at this rate of attendance it is desired that he or she receive 11.7% of all required nutrients (except for fat which should be less than 11.7%), and such is generally the case for most nutrients across all ration status/residence groups. These results are not surprising since the typical meal nutrition analysis presented earlier confirmed that all minimum daily dietary allowances, with the minor exception of food energy, were met for the typical military food service system meal at Travis AFB. A detailed analysis of food costs and nutrient compliance or non-compliance for the specified ration status/residence groups will be deferred until part 4 of this section (Actual System Users on any Given Day).

Not unexpectedly the food cost and nutrient levels for the various consumer groups varied in direct proportion to the meals/person/day utilization rates. Since the group of all potential users included a high percentage of non-users (approximately 54% of the

total BAS personnel did not use the military system of food service), the average food cost and nutrient values per person per day were significantly shifted to the low side. It is evident from these results in Table 2 that the average RIK customer receives a significant proportion (an average of 50.0% across all ten nutrients) of his or her daily nutrition allowances in the military system (even a larger proportion on weekdays). The average dormitory residing BAS customer, however, obtains only a marginal proportion (an average of 17.1% across all ten nutrients) of his or her daily nutritional requirements from the Air Force food service system. The average BAS customer who is not living in the dormitories receives so little (an average of 3.0% for on post non-dormitory residents and 4.1% for off post personnel across all ten nutrients) of his or her daily requirement (even on weekdays) from the military system, that concern for his or her nutritional status should be directed towards what he or she consumes outside the military food service system.

2. Actual System Users

In order to eliminate the effect that the large non-user groups had on defining the average customer, it was decided to redefine the population and present the data considering only those customers who had attended the military system of food service at least once during the 50-day sampling period. Table 3 presents the resultant food cost and nutrition for those personnel.

As would be anticipated, the utilization rates and the food costs and nutrition per day data are greater than in the preceding analysis. For the RIK personnel the increase is slight since, as discussed extensively in reference 9, most RIK customers utilized the dining facility system at least once during the 50-day period. However, over the duration of the entire experiment only some 46% of all BAS personnel ever attended a dining facility meal. Hence, the increase from 0.11 to 0.26 meals/person/day for the BAS customers during the 50-day sampling period should not be considered suspect. Also, the significant increase in food cost and nutrition for the BAS consumer appears reasonable.

It is important to note, however, that the comments offered for the potential system customer case are generally applicable to the data here even though there have been substantial increases in average customer nutrition. RIK customers still receive a significant portion of their daily nutrition in the military system while BAS customers who do not reside in the dormitories do not in spite of the more than two to one increase in utilization. Again, as was the case for all potential system users the relative nutrition provided to each customer when he or she attended was, in general, equal to or greater than the percent associated with the percent of the number of meals attended of a three-meal day.

TABLE 2
AVERAGE FOOD COSTS AND NUTRIENT VALUES
FOR ALL POTENTIAL SYSTEM USERS

Ration Status and Residence	Average Meals per Person per Day	Cost (\$)	Food Energy (CAL)	Protein (g)	Fat (g)	Calcium (mg)	Iron (mg)	Vitamin A (IU)	Thiamine (mg)	Ribo- flavin (mg)	Niacin (mg)	Ascorbic Acid (mg)
Total	0.35 (11.7)	2.24	3400.00	100.0	<152.0	800.0	14.00	5000.0	1.70	2.00	22.00	60.00
		0.21	395.1	17.8	17.1	156.3	2.6	823.3	0.32	0.31	3.53	16.50
		9.5	11.6	17.8	11.3	19.5	18.9	16.5	18.9	15.5	16.0	27.5
RIK	1.01 (33.7)	0.62	1138.2	51.4	48.9	449.2	7.62	2385.7	0.93	0.89	10.25	47.48
		27.6	33.5	51.4	32.2	56.1	54.4	47.7	54.8	44.6	46.6	79.1
On Post In Dorms	1.03 (34.3)	0.63	1160.8	52.4	49.9	458.2	7.77	2433.6	0.95	0.91	10.47	48.42
		28.2	34.1	52.4	32.8	57.3	55.5	48.7	55.9	45.5	45.6	80.7
Not In Dorms	0.49 (16.3)	0.30	550.5	24.7	23.9	216.2	3.67	1152.9	0.45	0.43	4.91	23.04
		13.3	16.2	24.7	15.7	27.0	26.2	23.1	26.3	21.6	22.3	38.4
BAS	0.11 (3.7)	0.07	125.4	5.6	5.6	50.2	0.84	255.8	0.100	0.10	1.08	5.27
		3.0	3.7	5.6	3.7	6.3	6.0	5.1	5.9	5.0	4.9	8.8
On Post In Dorms	0.35 (11.7)	0.21	386.0	17.3	17.1	156.0	2.59	806.0	0.31	0.31	3.31	16.48
		9.3	11.4	17.3	11.2	19.5	18.5	16.1	18.4	15.5	15.1	27.5
On Post Not In Dorms	0.06 (2.0)	0.04	69.8	3.1	3.2	28.1	0.46	135.2	0.05	0.06	0.58	2.90
		1.6	2.1	3.1	2.1	3.5	3.3	2.7	3.2	2.8	2.7	4.8
Off Post	0.08 (2.7)	0.05	93.7	4.2	4.2	37.2	0.62	189.3	0.07	0.07	0.81	3.90
		2.2	2.8	4.2	2.8	4.7	4.5	3.8	4.3	3.7	3.7	6.5
RIK Weekdays Only	1.18 (39.3)	0.72	1325.1	59.6	56.8	515.5	8.77	2664.5	1.08	1.03	12.08	54.32
		32.0	39.0	59.6	37.4	64.4	62.6	53.3	63.8	51.7	54.9	90.5
BAS Week days Only	0.13 (4.3)	0.08	146.5	6.5	6.5	58.1	0.98	301.9	0.12	0.12	1.27	6.17
		3.5	4.3	6.5	4.3	7.3	7.0	6.0	6.9	5.8	5.8	10.3

TABLE 3
AVERAGE FOOD COSTS AND NUTRIENT VALUES
FOR ACTUAL SYSTEM USERS

Ration Status and Residence	Average Meals per Person per Day	Cost (\$)	Food Energy (CAL)	Protein (g)	Fat (g)	Calcium (mg)	Iron (mg)	Vitamin A (IU)	Thiamine (mg)	Ribo- flavin (mg)	Niacin (mg)	Ascorbic Acid (mg)
Total	0.63 (21.0)	2.24 0.38 17.2	3400.00 711.2 20.9	100.0 32.0 32.0	<152.0 30.8 20.3	800.0 281.3 35.2	14.00 4.76 34.0	5000.0 1482.0 29.6	1.70 0.58 34.0	2.00 0.56 27.9	22.00 6.35 28.9	60.00 29.70 49.5
RIK	1.10 (36.7)	0.67 30.1	1239.7 36.5	55.9 55.9	53.3 35.1	489.2 61.2	8.30 59.3	2598.3 52.0	1.01 59.6	0.97 48.6	11.17 50.8	51.71 86.2
On Post In Dorms	1.12 (37.3)	0.69 30.6	1262.2 37.1	57.0 57.0	54.2 35.7	498.2 62.3	8.45 60.4	2646.3 52.9	1.03 60.7	0.99 49.5	11.38 51.7	52.65 87.7
Not in Dorms	0.66 (22.0)	0.40 17.9	741.4 21.8	33.2 33.2	32.1 21.1	291.2 36.4	4.94 35.3	1552.9 31.1	0.60 35.5	0.58 29.1	6.61 30.1	31.03 51.7
BAS	0.26 (8.7)	0.16 7.0	296.4 8.7	13.3 13.3	13.3 8.7	118.7 14.8	1.98 14.1	604.7 12.1	0.23 13.8	0.23 11.7	2.54 11.6	12.46 20.8
On Post in Dorms	0.47 (15.7)	0.28 12.5	518.4 15.3	23.2 23.2	22.9 15.1	209.5 26.2	3.48 24.9	1082.3 21.7	0.42 24.7	0.42 20.8	4.45 20.2	22.13 36.9
On Post Not In Dorms	0.18 (6.0)	0.11 4.8	209.3 6.2	9.3 9.3	9.6 6.3	84.3 10.5	1.39 9.9	405.7 8.1	0.16 9.5	0.17 8.3	1.75 8.0	8.71 14.5
Off Post	0.20 (6.7)	0.12 5.5	234.3 6.9	10.5 10.5	10.5 6.9	93.0 11.6	1.56 11.1	473.1 9.5	0.18 10.8	0.18 9.2	2.02 9.2	9.74 16.2

3. Actual System Users by Usage Rates

Because of the positive shift in average customer nutrition occasioned by eliminating the non-user group, a reanalysis and presentation of customer food cost and nutritional data by three different customer usage rates were deemed appropriate. The objective was to allow the reader to make his or her own judgments as to what percentages of the different population usage groups got a significant amount of their daily nutritional needs from the military system of food service.

Table 4 following indicates the food cost and nutritional data for three different levels of utilization for both RIK and BAS actual system users. For comparative purposes the all potential and all actual system user figures discussed previously are also noted. The three specified utilization levels — one meal per week or more, two and one-half meals per week or more, and seven meals per week or more — are an attempt to identify the lower bounds on what might be considered low, medium, and high degrees of utilization.

As would be expected, the absolute per day nutrition increased with the utilization level for both RIK and BAS customers. Once again, the RIK customers appear to be getting a significant portion of their daily nutrition requirements from the military system. Eighty-seven percent of the RIK customers received approximately one-third of their daily nutrition requirements while twenty-eight percent received approximately one-half their daily requirements via the Travis food service system. However, regardless of which way the data on the BAS customer is analyzed, a most significant fifty-four percent of BAS customers were not even attending the military system (and, therefore, were receiving none of their daily nutrition requirements from it) while eighty-four percent were receiving only one-fifth of their daily requirements. As in the previous cases, the nutrition, as a percentage of the minimum daily standards represented by the actual food items selected by attending customers, was greater than the percentage associated with their participation rates as compared to the three meal day standard.

4. Actual System Users on Any Given Day

Of considerable interest is an analysis of the food cost and nutrient levels on a typical day for the food service system during the Travis experiment. By definition such a daily "snapshot" analysis would consider only those personnel who actually used the system at least once on the day in question. Of primary interest then on a day when a customer attended at least one meal was the total number of meals he or she attended that day and, correspondingly, what level of nutritional benefit he or she derived from the military system of food service on that day. Table 5 presents these data as an average of 50 individually analyzed days.

TABLE 4
AVERAGE FOOD COSTS AND NUTRIENT VALUES
FOR ACTUAL SYSTEM USERS BY USAGE RATES

Ration Status and Residence	Average Meals per Person per Day	Food		Protein (g)	Fat (g)	Calcium (mg)	Iron (mg)	Vitamin A (IU)	Thiamine (mg)	Ribo- flavin (mg)	Niacin (mg)	Ascorbic Acid (mg)
		Cost (\$)	Energy (CAL)									
		2.24	3400.00	100.0	<152.0	800.0	14.00	5000.0	1.70	2.00	22.00	80.00
RIK												
All Potential Users (100%)	1.01 (33.7)	0.62 27.6	1138.2 33.5	51.4 51.4	48.9 32.2	449.2 56.1	7.62 54.4	2385.7 47.7	0.93 54.8	0.89 44.6	10.25 46.6	47.48 79.1
All Actual Users (92%)	1.10 (36.7)	0.67 30.1	1239.7 36.5	55.9 55.9	53.3 35.1	489.2 61.2	8.30 59.3	2598.3 52.0	1.01 59.6	0.97 48.6	11.17 50.8	51.71 86.2
1 meal/wk or more (87%)	0.79 (26.3)	0.48 21.4	892.6 26.3	40.2 40.2	38.4 25.3	352.2 44.0	5.98 42.7	1870.8 37.4	0.73 42.9	0.70 35.0	8.04 36.6	37.23 62.1
2.5 meals/wk or more (75%)	0.88 (29.3)	0.54 24.1	901.8 26.5	44.7 44.7	42.6 28.0	391.4 48.9	6.64 47.4	2078.6 41.6	0.81 47.7	0.78 39.0	8.93 40.6	41.37 69.0
7 meals/wk or more (28%)	1.33 (44.3)	0.81 36.2	1500.0 44.1	67.6 67.6	64.5 42.4	591.9 74.0	10.04 71.7	3143.9 62.9	1.22 71.8	1.17 58.5	13.52 61.5	62.57 104.3
BAS												
All Potential Users (100%)	0.11 (3.7)	0.07 3.0	125.4 3.7	5.6 5.6	5.6 3.7	50.2 6.3	0.84 6.0	255.8 5.1	0.10 5.9	0.10 5.0	1.08 4.9	5.27 8.8
All Actual Users (45%)	0.26 (8.7)	0.16 7.0	296.4 8.7	13.3 13.3	13.3 8.7	118.7 14.8	1.98 14.1	604.7 12.1	0.23 13.8	0.23 11.7	2.54 11.6	12.46 20.8
1 meal/wk or more (16%)	0.38 (11.0)	0.23 10.3	432.7 12.7	19.4 19.4	19.4 12.8	173.3 21.7	2.89 20.6	882.9 17.7	0.36 21.2	0.36 18.0	3.71 16.9	18.19 30.3
2.5 meal/wk or more (5%)	0.56 (18.7)	0.34 15.2	637.3 18.7	28.6 26.6	28.6 18.8	255.2 31.9	4.26 30.4	1300.1 26.0	0.49 28.8	0.49 24.5	5.46 24.8	26.79 44.7
7 meals/wk or more (1%)	1.19 (39.7)	0.73 32.6	1357.5 39.9	60.9 60.9	60.9 40.1	543.6 68.0	9.07 64.8	2769.5 55.4	1.05 61.8	1.05 52.5	11.63 52.9	57.07 95.1

TABLE 5
AVERAGE FOOD COSTS AND NUTRIENT VALUES FOR ACTUAL SYSTEM
USERS ON ANY GIVEN DAY

Ration Status and Residence	Average Meals per Person per Day	Cost (\$)	Food Energy (Cal)	Protein (g)	Fat (g)	Calcium (mg)	Iron (mg)	Vitamin A (IU)	Thiamin (mg)	Ribo- flavin (mg)	Niacin (mg)	Ascorbic Ac (mg)
Total	1.50 (50.0)	2.24	3400.0	100.0	<152.0	800.0	14.00	5000.0	1.70	2.00	22.00	50.00
		0.92	1686.0	75.9	73.1	664.5	11.27	3518.6	1.38	1.32	15.07	70.34
		41.1	49.6	75.9	48.1	83.1	80.5	70.4	81.2	66.0	68.5	117.2
RIK	1.63 (54.3)	1.00	1826.2	82.4	78.5	717.4	12.22	3830.6	1.50	1.43	16.49	76.06
		44.6	53.7	82.4	51.6	83.7	87.3	76.6	88.2	71.5	75.0	126.8
On Post In Dorms	1.63 (54.3)	1.00	1829.7	82.6	78.7	719.5	12.25	3844.6	1.50	1.43	16.51	76.25
		44.6	53.8	82.6	51.8	89.9	87.5	76.9	88.2	71.5	75.0	127.1
Not In Dorms	1.44 (48.0)	0.88	1618.3	72.5	70.2	633.1	10.79	3394.5	1.32	1.27	14.44	67.66
		39.3	47.6	72.5	46.2	79.1	77.1	67.9	77.6	63.5	65.6	112.8
BAS	1.12 (37.3)	0.68	1278.3	57.2	57.2	510.4	8.52	2611.6	1.02	1.01	10.96	53.72
		30.4	37.6	57.2	37.6	63.8	60.9	52.2	60.0	50.5	49.8	89.5
On Post In Dorms	1.20 (40.0)	0.72	1324.0	59.3	58.6	532.6	8.88	2770.9	1.08	1.06	11.37	56.48
		32.1	38.9	59.3	38.6	66.6	63.4	55.4	63.5	53.0	51.7	94.1
On Post Not In Dorms	1.07 (35.7)	0.64	1236.9	55.1	56.7	497.0	8.18	2398.2	0.96	0.98	10.35	51.44
		28.6	36.4	55.1	37.3	62.1	58.4	48.0	56.5	49.0	47.0	85.7
Off Post	1.07 (35.7)	0.66	1252.7	56.0	56.3	496.5	8.32	2532.7	0.98	0.98	10.78	52.08
		29.5	36.8	56.0	37.0	62.1	59.4	50.7	57.6	49.0	49.0	86.8

As expected the analysis shows that calculated nutritional values increased significantly over the three cases analyzed preceding for all types of customers. The RIK customer obtained substantially more than half of his or her daily nutritional requirements. Also, this is the only case covered herein where the BAS customer received a significant amount of his or her daily nutritional requirement from the military system of food service. However, since the average BAS customer attended one or more meals daily most infrequently, the lack of consistency with which he or she received a substantial portion of the daily dietary allowance in the military system still leads to the conclusion that, on the average, he or she is not receiving a significant portion of the prescribed requirements from that system.

The military food cost of \$0.92 per person per day for the entire consuming population on any given day represented 82.2% of \$1.12, that portion of the daily ration allowance (i.e., the BDFA) associated with a \$2.24 BDFA and a fifty percent utilization rate. Since the BDFA is a reflection of the cost of raw food of a daily entitled ration, to say that the cost of those same foods as served represented 82.2% of the raw food cost is certainly not unreasonable given the waste and shrinkage associated with preparation and cooking.

The relative percentage nutrition provided each customer, regardless of ration status and residency, complied with the DDA requirements for the specified utilization levels in all cases for all nutrients except, in certain instances, food energy and fat. Both RIK customer groups were slightly (less than 2%) deficient in food energy. However, because overweight rather than underweight is considered more of a problem, caloric shortage is of less concern particularly when all other nutrients complied with prescribed requirements.

Those BAS customers living on the post and in dormitories showed the same food energy noncompliance/fat compliance as did the RIK customers. However, those BAS customers living on post not in dormitories and off post showed the reverse situation of food energy compliance/fat noncompliance. Although fat noncompliance is undoubtedly of more concern than food energy noncompliance, the fat excesses for the various BAS residency groups were only marginally greater than the 40% caloric requirement.

It is most significant to note that the nutrient values associated with these latter two BAS customer groups (the non-dormitory BAS groups) were notably higher when compared to their utilization rates than for the BAS on post in dormitory groups. Remembering, as noted in Tables 2 and 3, that both segments of the non-dormitory residing BAS group attended with a significantly lower frequency than the BAS dormitory groups, it can be concluded that when they attended BAS customers not residing in dormitories tended to select more food than did those BAS customers who lived in dormitories. In addition, the data indicate that the non-dormitory residing BAS customers when they attended also selected more food than did RIK customers when they attended.

AN ANALYSIS OF INDIVIDUAL CONSUMER BEHAVIOR

Thus far the principal concern has been with the daily meal attendance patterns and the corresponding mean food cost and nutritional values of the "average" customer. In this section a distribution of customer nutrition has been developed. This presents an entire picture of the behavior of the Air Force customers during a portion of the experiment rather than a point estimate of the average consumer. The reader is encouraged to make his or her own judgments as to the nutritional adequacies of the food service system based on these distributions. The attendance and nutritional patterns of 861 randomly selected individual potential dining facility customers are used to develop these distributions and accompanying nutrient histograms for an 18-day period during January 1974.

The personnel sample reflected the different types of individual potential users as actually represented in the overall population at Travis during the experiment. Therefore, the sample included 653 individuals who had been issued a prenumbered plastic meal card and 208 others who had not. For the purposes of the simulation those 208 individuals (all of whom had a BAS ration status) were considered nonusers of the food service system. The total sample included 613 BAS and 248 RIK individuals. These proportions are directly related to the fact that during the experiment almost three quarters of the base enlisted strength were BAS personnel. A detailed distribution of the sample is noted below.

	RIK		BAS		TOTAL	
	N	%	N	%	N	%
Had Card-Attended	208	83.9	128	20.9	336	39.0
Had Card-Did Not Attend	40	16.1	277	45.2	317	36.8
Did Not Have Card	0	0.0	208	33.9	208	24.2
TOTAL	248	100.0	613	100.0	861	100.0

A further breakout of the total sample by ration status and residence location is shown below.

	RIK		BAS		TOTAL	
	N	%	N	%	N	%
On Post In Dormitories	236	95.2	123	20.1	359	41.7
On Post Not In Dormitories	1	0.4	139	22.7	140	16.3
Off Post	11	4.4	351	57.2	362	42.0
TOTAL	248	100.0	613	100.0	861	100.0

A complete summary of attendance and overall meal utilization rates for the 18-day period are found in the table following. In this table the BAS ration status category has been divided into those personnel residing in dormitories (referred to simply as BAS) and those not residing in dormitories (referred to as BAS*).

	RIK	BAS	BAS*	TOTAL
Number of Potential Users	248	123	490	861
Number of Actual Users	208	41	87	336
Total Meals Attended	3296	265	283	3844
Meals/Person/Day (Unconditional) ¹	0.74	0.12	0.03	0.25
Meals/Person/Day (Conditional) ²	0.88	0.35	0.18	0.64

¹Based on the number of potential users.

²Based on the number of actual users during the 18-day period

As would be expected given the analysis presented earlier, the RIK personnel in the sample had a much higher utilization rate than did the BAS personnel. Similarly, BAS dormitory residents utilized the food service system more readily than did those BAS personnel not living in dormitories. However, it should be noted here that the utilization rates for the sample are smaller than were earlier indicated on Tables 2 and 3 for the entire Travis population during the experiment. This is attributable to the fact that in the earlier cases a 50-day period was being considered whereas only an 18-day period is used here.

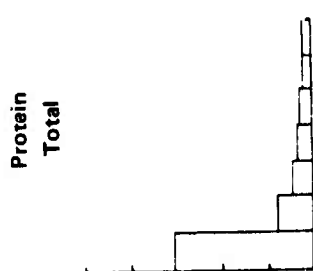
Meal-by-meal utilization rates for the entire sample population for the 18-day period are noted below. Also shown for comparative purposes are the utilization rates for all system customers for the 50-day period discussed previously.

Meals	Sample Meals	18-day Sample Population %	50-day Total Population %
Break fast	553	14.4	18.3
Dinner	1523	39.6	39.0
Supper	602	15.7	18.1
Specialty	234	6.1	6.0
Night Meal	147	3.8	3.9
Flight Line	263	6.8	7.3
Modular	522	13.6	7.4
TOTAL	3844	100.0	100.0

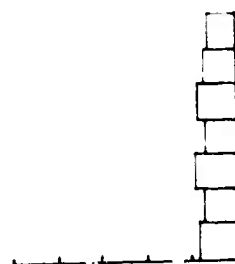
The distribution of the daily food costs and nutritional values for the total sample, each of the various ration status/residence groups, and for those persons attending three or more meals and nine or more meals during the period have been developed and are presented in Appendix B. These distributions have been converted to graphical form by ration status for food cost and for each of the ten nutrient components and are presented herein. All of these distributions are based on percentages of the BDFA and the DDA requirements. For the food cost distributions the \$2.24 BDFA value represents the 100% level. Previous nutritional analyses in this report used average food cost and nutrient values for each meal type to determine the total nutrition for the daily attendance pattern of each customer. Here, however, for each meal of an individual's daily attendance pattern, a random nutritional profile for that meal was selected from the sample of all meals of the same type. The column labelled "ATT" in Appendix B indicates the approximate number of people in the sample who attended at a rate corresponding to the stated percentage range.

Again as in the previous cases where only average values of customer nutrition were considered, the distributions in Appendix B and their graphical representations confirm that the RIK type customers appear to be obtaining significant nutritional value from the military system of food service. On the other hand, however, the distributions for both groups of BAS type customers reaffirm the previous results that these customers are obtaining their nutritional benefits not within the military food service system but rather outside it.

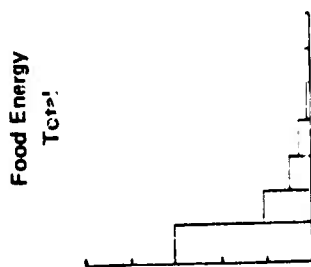
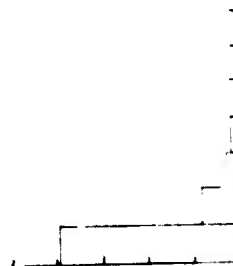
From the data in Appendix B several additional points are worthy of mention. Given that the utilization rates decreased in going from RIK to BAS and then to BAS* consumers, a similar decrease in nutritional values via a lower end shifting of the nutritional distributions would be expected and, in fact, occurred as can be seen in Appendix B. However, when considering those user groups attending three or more meals and nine or more meals during the 18-day period, an upper-end shifting of the nutrient distributions, as would be anticipated, was realized. Also, if a certain percentage range (e.g., the 0-5 percent range) on any ration status residency distribution is considered the percentage



RIK



BAS

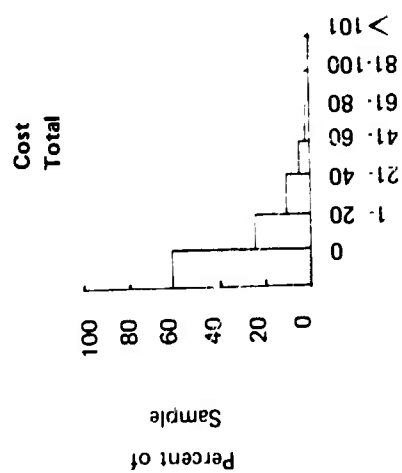


Percent of Minimum
Daily Requirement

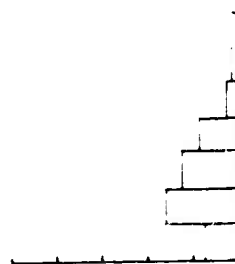
RIK



BAS



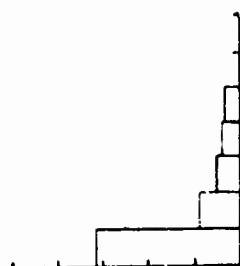
RIK



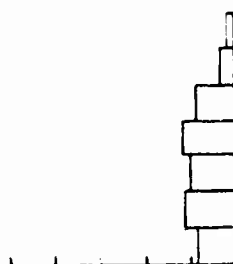
BAS



Iron
Total



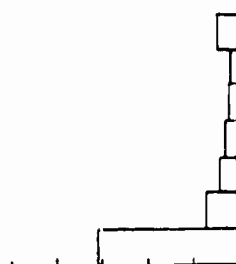
RIK



BAS

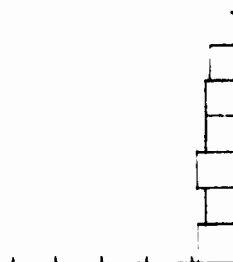


Calcium
Total

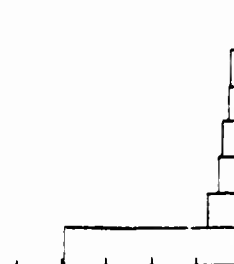


Percent of Minimum
Daily Requirement

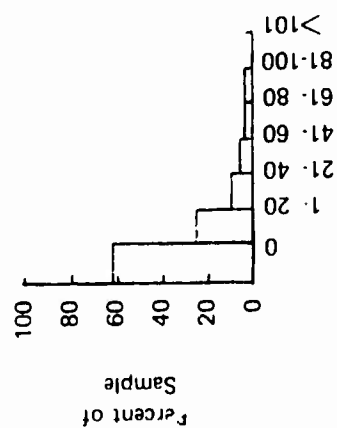
RIK



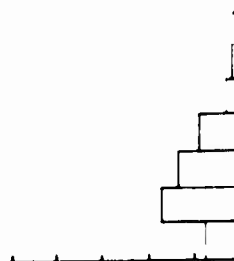
BAS



Fat
Total

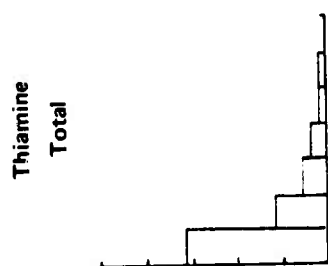
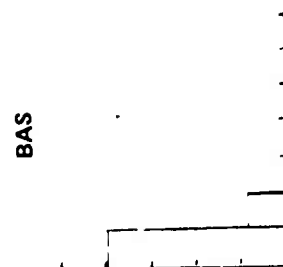
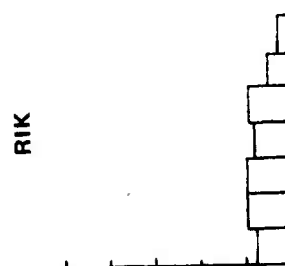
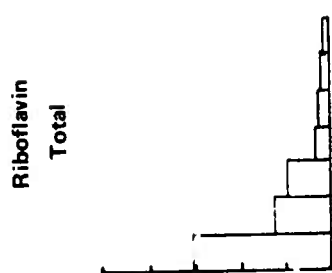


RIK

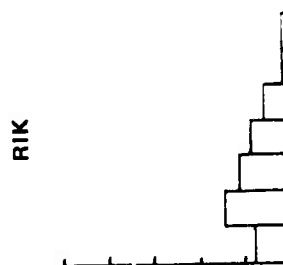
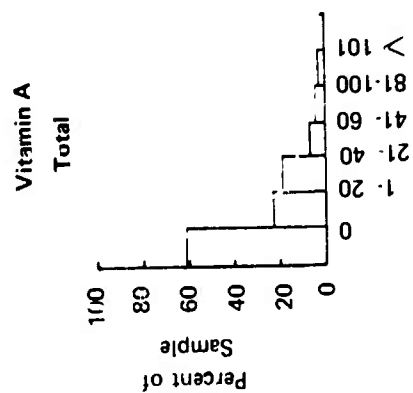
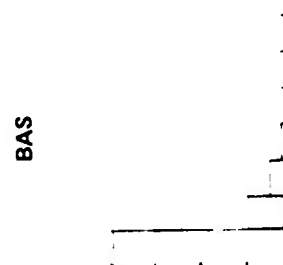
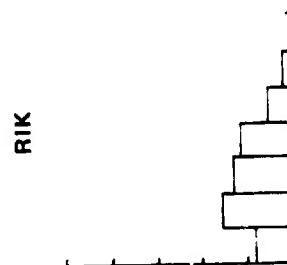


BAS



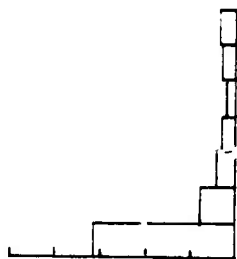


**Percent of Minimum
Daily Requirement**



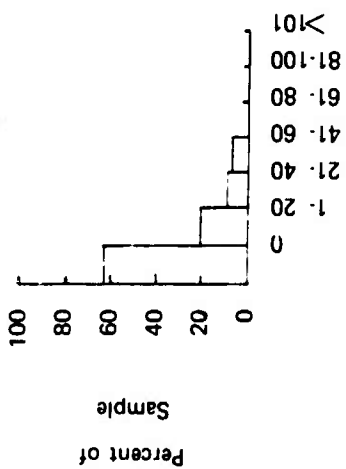
Vitamin C

Total



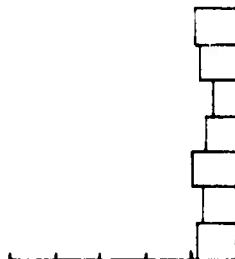
Niacin

Total

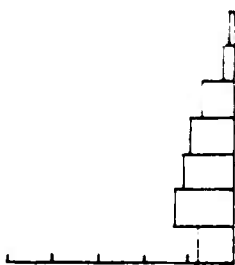


**Percent of Minimum
Daily Requirement**

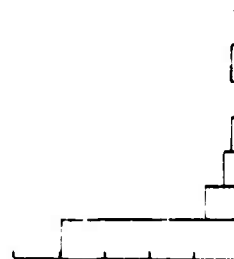
RIK



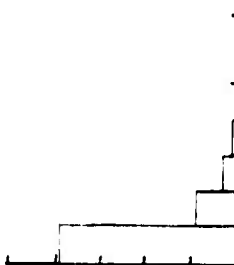
RIK



BAS



BAS



of users for each nutritional component does not necessarily remain the same. This, of course, is not surprising since a given meal does not supply the same relative proportions of each nutrient.

CUSTOMERS CHANGING RATION STATUS

Inasmuch as the Air Force is considering the possible implementation of an a la carte, all BAS ration status food service system, an analysis of average food costs and nutrient values for customers who changed ration status during the experiment was deemed appropriate. For the experimental period it was possible to uniquely identify 84 dining facility customers who changed their ration status from RIK to BAS. Table 6 following indicates the average daily food costs and nutritional data for these 84 individuals both as RIK and BAS customers.

Table 2 indicated that average meals/person/day rates for the average Travis RIK and BAS customers, considering all potential system users as the system population were, respectively, 1.01 and 0.11 meals/person/day. Obviously, these rates differ significantly from those being considered here as noted on Table 6. For a detailed explanation of the difference the reader is encouraged to consult reference 9.

Despite the differences in system utilization, nutritionally the RIK and BAS groups being addressed here are essentially the same as the overall, all potential RIK and BAS populations considered earlier. Therefore, the comments made in the earlier discussions should be considered applicable here as well.

AN ANALYSIS OF THE THREE NEW FOOD SERVICE OPERATIONS AND THE STANDARD DINING HALL MEALS

Included herein is an analysis of each of the three new food service operations introduced during the experiment (the modular facility, the flight line facility, and the specialty meal) and the standard dining hall operations using the daily "snapshot" approach introduced earlier. For each of the four sections of Table 7 average daily food costs and nutritional data are provided for both RIK and BAS system users. Shown in parentheses under the meals/person/day utilization figures are the percentages that relate those figures on a percentage basis to a three meal per person per day standard. The associated daily individual attendance patterns implicit in the analysis contain at least one meal at the meal service being considered. For example, the modular facility RIK cost and nutrition data are based on the composite summation of all RIK daily attendance patterns that include at least one modular facility meal. For the dining hall operation only attendance patterns that include one or more of the four standard dining hall meals (breakfast, dinner, supper and midnight meal) and exclude all of three new services meals are included.

TABLE 6
AVERAGE FOOD COSTS AND NUTRIENT VALUES
FOR CUSTOMERS CHANGING RATION STATUS

Ration Status and Residence	Average Meals per Person per Day	Cost (\$)	Food Energy (CAL)	Protein (g)	Fat (g)	Calcium (mg)	Iron (mg)	Vitamin A (IU)	Thiamine (mg)	Ribo- flavin (mg)	Niacin (mg)	Ascorbic Acid (mg)
		2.24	3400.00	100.0	<152.0	800.0	14.00	5000.0	1.70	2.00	22.00	60.00
RIK	0.78 (26.0)	0.48 21.3	880.4 25.9	39.6 39.6	37.8 24.8	342.5 42.8	5.82 41.6	1770.3 35.4	0.72 42.4	0.69 34.4	8.03 36.5	36.09 60.2
BAS	0.27 (9.0)	0.16 7.1	300.0 8.8	13.4 13.4	13.3 8.8	118.9 14.9	2.00 14.3	617.8 12.4	0.24 14.1	0.24 11.9	2.59 11.8	12.62 21.0

TABLE 7.
AVERAGE FOOD COSTS AND NUTRIENT VALUES FOR ATTENDANCE PATTERNS ON THE
THREE NEW FOOD SERVICE OPERATIONS AND OF THE STANDARD DINING HALL MEALS

Ration Status and Residence	Average Meals per Person per Day	Cost (\$)	Food Energy (CAL)	Protein (g)	Fat (g)	Calcium (mg)	Iron (mg)	Vitamin A (IU)	Thiamin (mg)	Ribo- flavin (mg)	Niacin (mg)	Ascorbic Acid (mg)
		2.24	3400.0	100.0	<152.0	800.0	14.00	5000.0	1.70	2.00	22.00	60.00
Modular Facility												
RIK	1.89 (63.0)	1.03 46.0	2156.5 63.4	95.7 95.7	90.1 59.3	800.2 100.0	13.11 93.6	2782.3 55.6	1.67 98.2	1.63 81.5	21.18 96.3	77.16 128.6
BAS	1.16 (38.7)	0.60 26.8	1334.2 35.2	59.0 59.0	54.9 36.1	483.0 60.4	7.77 55.5	1242.4 24.8	1.01 59.4	0.99 33.0	13.62 61.9	44.11 73.5
Flight Line Facility												
RIK	1.82 (60.7)	1.25 55.8	2400.6 70.6	107.7 107.7	116.2 76.4	947.8 118.5	15.64 111.7	4183.5 83.7	1.77 104.1	1.83 91.5	19.82 90.1	94.73 157.9
BAS	1.10 (36.7)	0.82 36.6	1594.7 46.9	71.6 71.6	80.9 53.2	626.2 78.3	10.29 83.5	2540.8 50.8	1.12 65.9	1.19 39.7	12.73 57.9	60.64 57.9
Specialty Meal												
RIK	1.96 (65.3)	1.29 57.6	2255.5 66.3	110.4 110.4	89.7 59.0	1007.5 125.9	16.49 117.8	5399.8 108.0	1.92 112.9	1.80 90.0	21.22 96.5	97.30 162.2
BAS	1.41 (47.0)	0.95 42.4	1634.8 48.1	32.5 82.5	63.1 41.5	766.2 95.8	12.32 88.0	4036.0 80.7	1.41 82.9	1.32 44.0	15.62 71.0	71.15 118.6
Standard Dining Hall Meals Only												
RIK	1.52 (50.7)	0.93 41.5	1657.5 48.8	73.8 73.8	71.3 46.9	640.3 80.0	11.14 79.6	3741.3 74.8	1.39 81.8	1.31 43.1	14.77 67.1	71.08 118.5
BAS	1.11 (37.0)	0.64 28.6	1197.4 35.2	53.1 53.1	52.3 34.4	476.7 59.6	8.03 57.4	2608.1 52.2	0.98 57.6	0.96 32.0	10.31 46.9	51.89 86.5

Modular Facility

The modular facility, located adjacent to one of the enlisted dormitory areas opened on 25 November 1973 and operated for 66 days of the experiment until 31 January 1974. The operating hours were from 1100-2130 daily. Average meals per day served at this fast food outlet were 372 (of which nearly 350 were to RIK personnel) representing about 11.4% of the total number of meals served in all dining facilities during this period. For a more detailed discussion of the operation of the modular facility the reader is encouraged to consult references 1 and 9.

An analysis of the average daily food costs and nutrient levels for those daily individual attendance patterns including at least one modular facility meal, as shown in the accompanying table, indicates a vitamin A noncompliance for both RIK and BAS customers. This was caused by the fact that the salad and fresh fruit portions of the modular facility menu were not served as often as intended. Although the menu had been augmented with salads and fresh fruit to provide a better nutritional balance, a larger than expected demand for fried chicken at the modular facility and for flight line facility meals often utilized all the available labor at the inflight kitchen thereby making it impossible to prepare as many salad and fresh fruit portions as intended. It can be shown, however, that if this problem had not existed and if these items had been served as originally anticipated, there would not have been a vitamin A noncompliance.

Flight Line Facility

The flight line facility operated for 89 days, serving an average of 202 meals per day (about 121 to RIK personnel), equally divided between the early meal, served from 1630 to 1900 hours, and the late meal, served from 2230 to 0200 hours. In total, the flight line facility provided 6.5% of the meals served in all dining facilities during the experiment. The flight line facility operation is discussed more fully in references 2 and 9.

A food cost and nutritional analysis of the daily attendance patterns including at least one flight facility meal shows a most noticeable fat noncompliance (excess). As the table indicates, almost all nutrient levels and certainly food costs are markedly higher for the attendance patterns including flight line facility meals than for those including modular facility, specialty meal, or only standard dining hall meals. This can be explained when it is understood that virtually unlimited customer self-service of high preference, high cost food items was allowed at the facility.

Specialty Meal

The ethnic, specialty meal was offered in one of the dining halls following the supper meal, serving an average of 175 meals per day (of which approximately 157 were to RIK

personnel). In all the specialty meals accounted for 5.8% of all meals served in all the dining facilities during the course of the experiment. A complete discussion of the specialty meal operation can be found in references 3 and 9.

An analysis of the average daily food costs and nutrition for daily individual attendance patterns including at least one specialty meal indicates no nutrient noncompliance for either RIK or BAS customers.

Standard Dining Hall Meals

All three of the dining halls at Travis AFB served breakfast, dinner, and supper, with one dining hall also serving a midnight meal. In total these meals accounted for 79.0% of the total meals served during the experiment. On the average 2187 meals were served daily in the dining halls, some 75% to RIK customers and 25% to BAS customers. Reference 9 discusses standard dining hall meals extensively.

A food cost and nutritional analysis of those daily attendance patterns that include only standard dining meals (excluding all new services meals) revealed a slight food energy noncompliance for both RIK and BAS customers. Remembering that this was generally found to have been the case for both the "typical" meal and the entire Travis population as described by the daily "snapshot" approach (refer to Table 5), this result would be expected since, as noted above, standard dining hall meals represented 79.0% of all meals served during the experiment. Again, because overweight is considered to be more of a problem than underweight, a food energy deficiency is of less concern especially when all other nutrient levels comply with prescribed requirements.

At this juncture several interesting observations should be made about the effect of the three new services on dining facility attendance. Table 7 indicates the following meals per person per day utilization rates for RIK and BAS customers:

	RIK	BAS
Standard Dining Hall Meals Only	1.52	1.11
Modular Facility	1.89	1.16
Flight Line Facility	1.82	1.10
Specialty Meal	1.96	1.41

Since the utilization rates for the RIK customers at each of the three new facilities show a marked increase over the dining hall only case, it can be concluded that these three new services were attended in addition to, and not as an alternative to, the standard dining hall meals. Although the importance of only slightly increasing BAS attendance is questionable, the modular facility and the specialty meal succeeded in doing that and, as in the RIK case, not at the expense but to the benefit of the standard dining hall meals. The flight line facility, on the other hand, actually tended to decrease BAS attendance at the standard dining hall meals. This, however, was as would be anticipated in that the facility was primarily designed to furnish meals to maintenance area personnel who, because of their work requirements, found it inconvenient (if not impossible) to attend standard dining hall meals.

RESULTS AND CONCLUSIONS

1. Before the food service system experiment at Travis AFB the typical dining facility served meal provided more than the DDA/3 level of each of ten analyzed nutritional components (the greater than DDA/3 level for the fat nutrient represented an excess).
2. During the experiment the typical dining facility food outlet served meal provided more than the DDA/3 level for eight of the nutritional components while providing less than the DDA/3 level for food energy and fat.
3. From the pre-experiment to experiment period the average daily RIK and BAS dining facility attendee experienced an increase in every nutrient component level. The average nutrient value increases were 31.7% and 15.3%, respectively, for the RIK and BAS enlisted personnel.
4. The average RIK customer received a significant proportion (an average of 50.0% across all ten nutrients) of his or her daily nutritional requirements from the military system of food service.
5. The average BAS customer who resided on post and in dormitories received a marginal proportion (an average of 17.1% across all ten nutrients) of his or her daily nutritional requirements from the military food service system.
6. The average BAS customer who did not reside on post and in dormitories received so little (an average of 3.0% for on post non-dormitories residents and 4.1% for off post personnel across all ten nutrients) of his or her daily nutritional requirements from the military food service system that concern for his or her nutrition status should be directed towards what he or she consumes outside and not inside the military system.

7. Given that an average Travis food service system customer ate one meal on any given day during the experiment, on the average he or she ate a total of 1.50 meals on that day receiving meals whose composite food items cost \$0.92 as compared to \$1.12, that portion of the \$2.24 BDFA represented by a fifty percent utilization rate.
8. If only those personnel who actually utilized the food service system at least once on any given day are considered, the average RIK customer and the average BAS customer living on post and in dormitories experienced on that day a slight food energy deficiency as compared to that portion of the DDA that should have been received for their respective utilization rates. Similarly, the average BAS customer living on post not in dormitories or living off post experienced on that day a marginal fat nutrient excess.
9. When they attended a military food service system meal, the average BAS customer living on post not in dormitories or living off post tended to select more food at a given meal than did either the average BAS customer living on post in dormitories or the average RIK customer.
10. A nutritional analysis of a randomly selected sample of potential food service system customers reaffirmed the contentions that the average RIK customer received a significant portion of his or her daily nutritional requirements from the military food service system while the average BAS customer not residing on Base and in dormitories did not.
11. After changing from the RIK to BAS ration status, customer utilization (and hence absolute nutrition as well) decreased almost threefold from 0.78 to 0.27 meals per person per day. Again, concern for the nutrition received by this BAS customer group should probably be directed at what is consumed outside the military food service system.
12. The nutrition provided to the average RIK and BAS customer whose individual daily attendance patterns included at least one modular facility meal was deficient in vitamin A because of an unintended curtailed offering of salads and fresh fruits at the modular facility during the experiment. This deficiency can be avoided in the future if these components are made a mandatory part of any modular fast food unit meal wherever and whenever these units are implemented.
13. The nutrition provided to RIK and BAS customers whose individual daily attendance patterns included at least one flight line facility meal showed a fat nutrient excess due to almost unlimited customer self-service of high preference, high cost food items at the facility.

14. The nutrition provided to RIK and BAS customers whose individual daily attendance patterns included at least one specialty meal showed no nutrient noncompliances.
15. The nutrition provided to RIK and BAS customers whose individual daily attendance patterns included only standard dining hall meals (i.e., breakfast, dinner, supper, and/or midnight meal) showed a food energy noncompliance. Again, however, because overweight is considered more of a problem than underweight this food energy shortage should be of little concern since all other nutrient components were in compliance.
16. Overall system utilization was increased by the operation of the three new services – the modular facility, the flight line facility, and the specialty meal – due to the fact that meals at these facilities were attended in addition to, and not as an alternative to, the standard dining hall meals.

REFERENCES

1. Hertweck, Gerald, et. al., "Experimental Evaluation of the Modular Fast Food Service Facility at Travis AFB," Technical Report No. 74-54-OR/SA, May 1974, Operations Research and Systems Analysis Office, U.S. Army Natick Laboratories, Natick, Massachusetts.
2. Hertweck, Gerald, et. al., "Experimental Evaluation of the Flight Line Facility at Travis AFB," Technical Report No. 75-4-OR/SA, June 1974, Operations Research and Systems Analysis Office, U.S. Army Natick Laboratories, Natick, Massachusetts.
3. Hertweck, Gerald, et. al., "An Experimental Evaluation of the Specialty Meal Service at Travis AFB," Technical Report No. 75-13-OR/SA, July 1974, Operations Research and Systems Analysis Office, U.S. Army Natick Laboratories, Natick, Massachusetts.
4. Davis, Mark M., "A Nutritional Evaluation of the Experimental Food Service System at Travis AFB, California," Technical Report No. 75-7-OR/SA, July 1974, Operations Research and Systems Analysis Office, U.S. Army Natick Laboratories, Natick, Massachusetts.
5. AFM 146-12 with Change 1 and Change 2, "Armed Forces Recipe Service," Departments of the Army, the Navy, and the Air Force, Washington, DC, September 1972.
6. Agriculture Handbook No. 8, "Composition of Foods," United States Department of Agriculture, Washington, DC, December 1963.
7. C8900-PL, "Federal Supply Catalog Price List, FSC Group 89 Subsistence," United States Government Printing Office, Washington, DC, 1 July 1974.
8. Mattus, Theodore T., Jr., et. al., "A Consumer Evaluation of the Experimental Food Service System at Travis AFB, California," Technical Report No. 75-8-OR/SA, June 1974, Operations Research and Systems Analysis Office, U.S. Army Natick Laboratories, Natick, Massachusetts.
9. Wetmiller, John R., "An Analysis of Attendance Patterns in the Experimental Food Service System at Travis AFB," Technical Report No. 75-75-OR/SA, December 1974, Operations Research and Systems Analysis Office, U.S. Army Natick Laboratories, Natick, Massachusetts.

APPENDIX A
UTILIZATION RATES FOR
DIFFERENT CUSTOMER GROUPS

	Breakfast	Dinner	Supper	Specialty	Night Meal	Flight Line	Modular
Total	18.3	39.0	18.1	6.0	3.9	7.3	7.4
RIK	17.3	38.6	19.5	6.7	3.8	5.8	8.3
On Post In Dormitories	17.2	38.5	19.5	6.9	3.8	5.7	8.4
Off Post	19.3	42.9	18.1	3.2	3.7	6.0	6.8
BAS	22.4	40.8	11.9	3.2	4.6	14.6	2.5
On Post In Dormitories	24.7	34.5	18.0	6.0	6.5	8.0	2.3
On Post Not In Dormitories	23.6	37.5	6.7	1.9	4.5	23.1	2.7
Off Post	19.8	47.3	7.3	1.0	3.0	19.0	2.6

APPENDIX B
AVERAGE FOOD COST AND NUTRIENT VALUE DISTRIBUTIONS
FOR INDIVIDUAL CONSUMER GROUPS

THE CELL MAX - M.I.J. VALUES

	COST	FOC.	ENV	PROTEIN	FAT	CALCIUM	IRON	VIT. A.	THIAMIN	RIBOFLVN	NIACIN	ASC. ACID
0- 5 PERCENT	-.001	-.001	-.001	-.001	-.001	-.001	-.001	-.001	-.001	-.001	-.001	-.001
0- 5 PERCENT	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
0- 5 PERCENT	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
5- 10 PERCENT	.112	170.000	170.000	5.000	7.600	40.000	.700	250.000	.085	.100	1.100	3.000
5- 10 PERCENT	.112	170.000	170.000	5.000	7.600	40.000	.700	250.000	.085	.100	1.100	3.000
5- 10 PERCENT	.224	340.000	340.000	10.000	15.200	80.000	1.400	500.000	.170	.200	2.200	6.000
10- 15 PERCENT	.224	340.000	340.000	10.000	15.200	80.000	1.400	500.000	.170	.200	2.200	6.000
10- 15 PERCENT	.336	510.000	510.000	15.000	22.800	120.000	2.100	750.000	.255	.300	3.300	9.000
15- 20 PERCENT	.336	510.000	510.000	15.000	22.800	120.000	2.100	750.000	.255	.300	3.300	9.000
15- 20 PERCENT	.448	680.000	680.000	20.000	30.400	160.000	2.800	1000.000	.340	.400	4.400	12.000
20- 25 PERCENT	.448	680.000	680.000	20.000	30.400	160.000	2.800	1000.000	.340	.400	4.400	12.000
20- 25 PERCENT	.560	850.000	850.000	25.000	38.000	200.000	3.500	1250.000	.425	.500	5.500	15.000
25- 30 PERCENT	.560	850.000	850.000	25.000	38.000	200.000	3.500	1250.000	.425	.500	5.500	15.000
25- 30 PERCENT	.672	1020.000	1020.000	30.000	45.600	240.000	4.200	1500.000	.510	.600	6.600	18.000
30- 35 PERCENT	.672	1020.000	1020.000	30.000	45.600	240.000	4.200	1500.000	.510	.600	6.600	18.000
30- 35 PERCENT	.784	1190.000	1190.000	35.000	53.200	280.000	4.900	1750.000	.595	.700	7.700	21.000
35- 40 PERCENT	.784	1190.000	1190.000	35.000	53.200	280.000	4.900	1750.000	.595	.700	7.700	21.000
35- 40 PERCENT	.896	1360.000	1360.000	40.000	60.800	320.000	5.600	2000.000	.680	.800	8.800	24.000
40- 45 PERCENT	.896	1360.000	1360.000	40.000	60.800	320.000	5.600	2000.000	.680	.800	8.800	24.000
40- 45 PERCENT	1.008	1530.000	1530.000	45.000	68.400	360.000	6.300	2250.000	.765	.900	9.900	27.000
45- 50 PERCENT	1.008	1530.000	1530.000	45.000	68.400	360.000	6.300	2250.000	.765	.900	9.900	27.000
45- 50 PERCENT	1.120	1700.000	1700.000	50.000	76.000	400.000	7.000	2500.000	.850	1.000	11.000	30.000
50- 55 PERCENT	1.120	1700.000	1700.000	50.000	76.000	400.000	7.000	2500.000	.850	1.000	11.000	30.000
50- 55 PERCENT	1.232	1870.000	1870.000	55.000	83.600	440.000	7.700	2750.000	.935	1.100	12.100	33.000
55- 60 PERCENT	1.232	1870.000	1870.000	55.000	83.600	440.000	7.700	2750.000	.935	1.100	12.100	33.000
55- 60 PERCENT	1.344	2040.000	2040.000	60.000	91.200	480.000	8.400	3000.000	1.020	1.200	13.200	36.000
60- 65 PERCENT	1.344	2040.000	2040.000	60.000	91.200	480.000	8.400	3000.000	1.020	1.200	13.200	36.000
60- 65 PERCENT	1.456	2210.000	2210.000	65.000	98.800	520.000	9.100	3250.000	1.105	1.300	14.300	39.000
65- 70 PERCENT	1.456	2210.000	2210.000	65.000	98.800	520.000	9.100	3250.000	1.105	1.300	14.300	39.000
65- 70 PERCENT	1.568	2380.000	2380.000	70.000	106.400	560.000	9.800	3500.000	1.190	1.400	15.400	42.000
70- 75 PERCENT	1.568	2380.000	2380.000	70.000	106.400	560.000	9.800	3500.000	1.190	1.400	15.400	42.000
70- 75 PERCENT	1.680	2550.000	2550.000	75.000	114.000	600.000	10.500	3750.000	1.275	1.500	16.500	45.000
75- 80 PERCENT	1.680	2550.000	2550.000	75.000	114.000	600.000	10.500	3750.000	1.275	1.500	16.500	45.000
75- 80 PERCENT	1.792	2720.000	2720.000	80.000	121.600	640.000	11.200	4000.000	1.360	1.600	17.600	48.000
80- 85 PERCENT	1.792	2720.000	2720.000	80.000	121.600	640.000	11.200	4000.000	1.360	1.600	17.600	48.000
80- 85 PERCENT	1.904	2890.000	2890.000	85.000	129.200	680.000	11.900	4250.000	1.445	1.700	18.700	51.000
85- 90 PERCENT	1.904	2890.000	2890.000	85.000	129.200	680.000	11.900	4250.000	1.445	1.700	18.700	51.000
85- 90 PERCENT	2.016	3060.000	3060.000	90.000	136.800	720.000	12.600	4500.000	1.530	1.800	19.800	54.000
90- 95 PERCENT	2.016	3060.000	3060.000	90.000	136.800	720.000	12.600	4500.000	1.530	1.800	19.800	54.000
90- 95 PERCENT	2.128	3230.000	3230.000	95.000	144.400	760.000	13.300	4750.000	1.615	1.900	20.900	57.000
95-100 PERCENT	2.128	3230.000	3230.000	95.000	144.400	760.000	13.300	4750.000	1.615	1.900	20.900	57.000
95-100 PERCENT	2.240	3400.000	3400.000	100.000	152.000	800.000	14.000	5000.000	1.700	2.000	22.000	60.000
100-999 PERCENT	2.240	3400.000	3400.000	100.000	152.000	800.000	14.000	5000.000	1.700	2.000	22.000	60.000
100-999 PERCENT	9999.999	9999.999	9999.999	9999.999	9999.999	9999.999	9999.999	9999.999	9999.999	9999.999	9999.999	9999.999

THE DISTRIBUTION OF THE NUTRITIONAL INTAKE OF 861 PEOPLE AT TRAVIS AFB

		COST		FOOD		ENY		PROTEIN		FAT		CALCIUM		IRON		VIT.A.		THIAMIN		RIBOFLVN		NIACIN		ASC-ACID			
ATT	SMPL	PCT	SMPL	PCT	SMPL	PCT	SMPL	PCT	SMPL	PCT	SMPL	PCT	SMPL	PCT	SMPL	PCT	SMPL	PCT	SMPL	PCT	SMPL	PCT	SMPL	PCT	SMPL	PCT	
0- 0 PCT	525	61.0	525	61.0	525	61.0	525	61.0	525	61.0	525	61.0	525	61.0	525	61.0	525	61.0	525	61.0	525	61.0	525	61.0	525	61.0	
0- 5 PCT	95	78	9.1	77	8.9	44	5.1	74	8.6	27	3.1	57	6.6	64	7.4	77	8.9	47	5.5	72	8.4	49	5.7	72	8.4	49	5.7
5- 10 PCT	54	58	6.7	54	6.3	41	4.8	55	6.4	44	5.1	36	4.2	51	5.9	48	5.6	43	5.0	46	5.3	31	3.6	43	5.0	31	3.6
10- 15 PCT	38	35	4.1	37	4.3	27	3.1	29	4.5	25	2.7	34	3.9	33	3.8	30	3.5	28	3.3	25	2.9	18	2.1	25	2.9	18	2.1
15- 20 PCT	25	29	3.4	23	3.4	25	2.9	29	3.4	21	2.4	28	3.3	33	3.8	35	4.1	24	2.8	34	3.9	27	3.1	34	3.9	27	3.1
20- 25 PCT	17	21	2.4	20	2.3	21	2.4	17	2.0	23	2.7	23	2.7	24	2.8	21	2.4	29	3.4	22	2.6	19	2.2	22	2.6	19	2.2
25- 30 PCT	19	17	2.0	19	2.2	21	2.4	13	1.5	18	2.1	16	1.9	15	1.7	12	1.4	17	2.0	16	1.9	16	1.9	17	2.0	16	1.9
30- 35 PCT	25	19	2.2	11	1.3	13	1.5	18	2.1	17	2.0	15	1.7	18	2.1	14	1.6	13	1.5	11	1.3	13	1.5	11	1.3	13	1.5
35- 40 PCT	17	19	2.2	29	3.4	14	1.6	22	2.6	11	1.3	8	.9	14	1.6	19	2.2	14	1.6	14	1.6	12	1.4	14	1.6	12	1.4
40- 45 PCT	16	14	1.5	12	1.4	8	.9	12	1.4	9	1.0	13	1.5	14	1.6	20	2.3	14	1.6	19	2.2	11	1.3	14	1.6	12	1.4
45- 50 PCT	14	14	1.5	12	1.4	16	1.9	17	2.0	13	1.5	15	1.7	12	1.4	15	1.7	9	1.0	13	1.5	10	1.2	15	1.7	9	1.0
50- 55 PCT	5	9	1.0	17	2.0	4	.5	12	1.4	11	1.3	14	1.6	14	1.6	14	1.6	13	1.5	12	1.4	7	.8	14	1.6	7	.8
55- 60 PCT	7	10	1.2	9	.9	14	1.6	9	1.0	9	1.0	13	1.5	11	1.3	10	1.2	11	1.3	9	1.0	9	1.0	10	1.2	9	1.0
60- 65 PCT	3	4	.5	2	.2	10	1.2	2	.2	11	1.3	11	1.3	7	.8	4	.5	10	1.2	15	1.7	6	.7	15	1.7	6	.7
65- 70 PCT	0	3	.2	3	.3	13	1.5	3	.3	5	.6	9	1.0	11	1.3	5	.6	13	1.5	10	1.2	6	.7	10	1.2	6	.7
70- 75 PCT	1	4	.5	3	.3	11	1.3	2	.2	9	1.0	9	1.0	5	.6	2	.2	14	1.6	5	.6	8	.9	5	.6	8	.9
75- 80 PCT	0	1	.1	2	.2	4	.5	2	.2	10	1.2	9	1.0	5	.6	3	.3	6	.7	4	.5	6	.7	4	.5	6	.7
80- 85 PCT	0	0	.0	0	.0	13	1.5	2	.2	8	.9	8	.9	2	.2	4	.5	5	.6	1	.1	13	1.5	1	.1	13	1.5
85- 90 PCT	0	1	.1	1	.1	7	.8	0	.0	7	.8	2	.2	0	.0	0	.0	10	1.2	3	.3	10	1.2	3	.3	10	1.2
90- 95 PCT	0	0	.0	0	.0	7	.8	0	.0	4	.5	3	.3	0	.0	0	.0	7	.8	2	.2	6	.7	2	.2	6	.7
95- 100 PCT	0	0	.0	0	.0	5	.6	0	.0	9	1.0	2	.2	0	.0	0	.0	3	.3	0	.0	8	.9	0	.0	8	.9
100-999 PCT	0	0	.0	0	.0	20	2.3	0	.0	50	5.8	9	1.0	1	.1	0	.0	11	1.3	2	.2	45	5.2	2	.2	45	5.2
VARIANCE		.1	267107.3		762.9		532.1		74356.4		10.3	775549.2		.1		.3		17.5		411.4							
STD DEV		.317	516.824		27.620		23.068		272.684		3.203	880.653		.278		.510		4.180		20.284							
MEAN-OVERALL		.171	281.438		15.178		12.660		149.921		1.756	486.110		.153		.280		2.267		10.894							
COND-MEAN-USERS		.429	726.310		38.893		32.440		384.172		4.500	1245.656		.392		.718		5.810		27.915							
SAMPLE		861	861		861		861		861		861	861		861		861		861		861							

THE DISTRIBUTION OF THE NUTRITIONAL INTAKE OF 861 PEOPLE AT TRAVIS AFB

RIK-ONLY

			COST FOOD ENY			PROTEIN			FAT			CALCIUM			IRON			VIT.A.			THIAMIN RIBOFLVN			NIACIN ASC.ACID		
			SMPL			PCT			SMPL			PCT			SMPL			PCT			SMPL			PCT		
ATT	SMPL	PCT	SMPL	PCT	SMPL	PCT	SMPL	PCT	SMPL	PCT	SMPL	PCT	SMPL	PCT	SMPL	PCT	SMPL	PCT	SMPL	PCT	SMPL	PCT	SMPL	PCT	SMPL	PCT
0- 0 PCT	40	16.1	40	16.1	40	16.1	40	16.1	40	16.1	40	16.1	40	16.1	40	16.1	40	16.1	40	16.1	40	16.1	40	16.1	40	15.1
0- 5 PCT	11	4.4	12	4.8	7	2.8	13	5.2	2	.8	9	3.6	9	3.6	9	3.6	13	5.2	6	2.4	12	4.8	9	3.6	9	3.6
5- 10 PCT	26	10.5	23	9.3	11	4.4	23	9.3	11	4.4	11	4.4	27	10.9	21	8.5	13	5.2	17	6.9	17	6.9	5	2.0	5	2.0
10- 15 PCT	27	8.9	23	9.3	7	2.8	23	9.3	12	4.8	15	6.0	16	6.5	17	6.9	12	4.8	10	4.0	10	4.0	6	2.4	6	2.4
15- 20 PCT	17	9.3	23	9.3	12	4.8	23	9.3	5	2.0	16	6.5	21	8.5	25	10.1	12	4.8	24	9.7	13	5.2	13	5.2	13	5.2
20- 25 PCT	15	6.5	14	5.6	16	6.5	14	5.6	13	5.2	16	6.5	19	7.7	15	6.0	18	7.3	17	6.9	12	4.8	12	4.8	12	4.8
25- 30 PCT	15	6.5	16	6.5	11	4.4	15	6.0	6	2.4	12	4.8	10	4.0	13	5.2	9	3.6	13	5.2	12	4.8	12	4.8	12	4.8
30- 35 PCT	17	6.9	10	4.0	8	3.2	17	6.9	12	4.8	11	4.4	15	6.0	13	5.2	10	4.0	10	4.0	10	4.0	12	4.8	12	4.8
35- 40 PCT	17	7.7	28	11.3	11	4.4	20	8.1	9	3.6	7	2.8	12	4.8	18	7.3	9	3.6	13	5.2	8	3.2	8	3.2	8	3.2
40- 45 PCT	16	5.6	12	4.8	7	2.8	12	4.8	7	2.8	11	4.4	13	5.2	17	6.9	13	5.2	17	6.9	8	3.2	8	3.2	8	3.2
45- 50 PCT	14	5.6	12	4.8	14	5.6	16	6.5	10	4.0	14	5.6	12	4.8	15	6.0	8	3.2	13	5.2	6	2.4	6	2.4	6	2.4
50- 55 PCT	9	3.6	16	6.5	4	1.6	12	4.8	7	2.8	12	4.8	14	5.6	13	5.2	11	4.4	12	4.8	12	4.8	7	2.8	7	2.8
55- 60 PCT	7	3.6	8	3.2	11	4.4	9	3.6	8	3.2	13	5.2	10	4.0	10	4.0	9	3.6	9	3.6	9	3.6	9	3.6	9	3.6
60- 65 PCT	3	1.6	2	.8	10	4.0	2	.8	8	3.2	11	4.4	6	2.4	4	1.6	10	4.0	15	6.0	15	6.0	4	1.6	4	1.6
65- 70 PCT	0	0	3	1.2	13	5.2	3	1.2	5	2.0	9	3.6	11	4.4	5	2.0	13	5.2	9	3.6	9	3.6	6	2.4	6	2.4
70- 75 PCT	1	1.6	3	1.2	11	4.4	2	.8	8	3.2	8	3.2	5	2.0	2	.8	14	5.6	5	2.0	5	2.0	7	2.8	7	2.8
75- 80 PCT	0	0	1	.4	4	1.6	2	.8	10	4.0	9	3.6	5	2.0	3	1.2	6	2.4	4	1.6	4	1.6	6	2.4	6	2.4
80- 85 PCT	0	0	0	0	13	5.2	2	.8	6	2.4	8	3.2	2	.8	4	1.6	4	1.6	1	.4	1	.4	11	4.4	11	4.4
85- 90 PCT	0	1	.4	1	.4	7	2.8	0	0	7	2.8	2	.8	0	0	0	0	0	10	4.0	3	1.2	9	3.6	9	3.6
90- 95 PCT	0	0	0	0	7	2.8	0	0	4	1.6	3	1.2	0	0	0	0	0	0	7	2.8	2	.8	6	2.4	6	2.4
95-100 PCT	0	0	0	0	4	1.6	0	0	9	3.6	2	.8	0	0	0	0	0	0	3	1.2	0	.8	8	3.2	8	3.2
100-999 PCT	0	0	0	0	20	8.1	0	0	49	19.8	9	3.6	1	.4	0	0	0	0	11	4.4	2	.8	4	1.6	4	1.6
VARIANCE	.2	479256.4	1363.5	959.2	134083.0	18.51395004.9	.1	.5	31.5	756.6																
STD DEV	.427	692.283	36.926	31.970	366.173	4.305	1181.103	.372	.686	5.615	27.507															
MEAN-OVERALL	.515	846.312	45.507	37.524	443.492	5.235	1419.158	.453	.831	6.833	32.552															
COND-MEAN-USERS	.614	1009.064	54.259	44.740	528.778	6.242	1692.073	.540	.991	8.147	38.811															
SAMPLE	248	248	248	248	248	248	248	248	248	248	248	248	248	248	248	248	248	248	248	248	248	248	248	248	248	248

BAS-COMPOSITE

40

THE DISTRIBUTION OF THE NUTRITIONAL INTAKE OF 861 PEOPLE AT TRAVIS AFB

861-WHO RESIDE IN THE BARRACKS

COST FOOD ERY PROTEIN FAT CALCIUM IRON VIT.A. THIAMIN RIBOFLVN NIACIN ASC.ACID

ATT	SMPL	PCT	SMPL	PCT	SMPL	PCT	SMPL	PCT	SMPL	PCT	SMPL	PCT	SMPL	PCT	SMPL	PCT	SMPL	PCT	SMPL	PCT
0- 5 PCT	82	92	66.7	82	66.7	82	66.7	82	66.7	82	66.7	82	66.7	82	66.7	82	66.7	82	66.7	82
5- 10 PCT	21	15	13.0	15	12.2	9	7.3	13	10.6	5	4.1	10	8.1	13	10.6	13	10.6	10	8.1	14
10- 15 PCT	4	11	8.5	10	8.1	9	7.3	12	9.8	10	8.1	9	7.3	10	8.1	7	5.7	9	7.3	4
15- 20 PCT	6	3	2.4	3	2.4	6	4.9	4	3.3	4	3.3	5	4.1	8	6.5	2	1.6	6	4.9	4
20- 25 PCT	5	4	3.3	5	4.1	3	2.4	3	2.4	3	2.4	3	2.4	3	2.4	7	5.7	3	2.4	4
25- 30 PCT	1	3	2.4	3	2.4	0	.0	2	1.6	3	2.4	2	1.6	2	1.6	3	2.4	2	1.6	4
30- 35 PCT	1	2	1.6	3	2.4	4	3.3	4	3.3	2	1.6	3	2.4	5	4.1	1	.8	3	2.4	2
35- 40 PCT	2	1	.8	0	.0	3	2.4	1	.8	0	.0	4	3.3	2	1.6	1	.8	2	1.6	1
40- 45 PCT	0	0	.0	1	.8	1	.8	2	1.6	0	.0	2	1.6	1	.8	3	2.4	1	.8	2
45- 50 PCT	0	0	.0	0	.0	2	1.6	1	.8	2	1.6	1	.8	0	.0	0	.0	1	.8	2
50- 55 PCT	0	0	.0	1	.8	0	.0	0	.0	2	1.6	1	.8	0	.0	1	.8	0	.0	3
55- 60 PCT	0	1	.8	0	.0	2	1.6	0	.0	1	.8	0	.0	0	.0	0	.0	1	.8	0
60- 65 PCT	0	0	.0	0	.0	0	.0	0	.0	2	1.6	0	.0	1	.8	0	.0	0	.0	1
65- 70 PCT	0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	1	.8	0
70- 75 PCT	0	0	.0	0	.0	0	.0	0	.0	1	.8	1	.8	0	.0	0	.0	0	.0	1
75- 80 PCT	0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0
80- 85 PCT	0	0	.0	0	.0	0	.0	0	.0	1	.8	0	.0	0	.0	0	.0	1	.8	0
85- 90 PCT	0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	1
90- 95 PCT	0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0
95- 100 PCT	0	0	.0	0	.0	0	.0	1	.8	0	.0	0	.0	0	.0	0	.0	0	.0	0
100-999 PCT	0	0	.0	0	.0	0	.0	0	.0	1	.8	0	.0	0	.0	0	.0	0	.0	1
VARIANCE		.0	77031.8	200.0	160.2	22498.1		2.8	270994.1		.0		.1		4.7		125.1			
STD DEV		.169	277.546	14.143	12.658	149.994		1.681	520.475		.158		.275		2.163		11.184			
MEAN-OVERALL		.075	129.722	6.482	6.077	72.037		.796	254.392		.076		.133		.967		5.245			
COND-MEAN-USERS		.224	389.155	19.447	18.232	216.110		2.387	763.176		.227		.399		2.901		15.735			
SAMPLE		127	123	123	123	123		123	123		123		123		123		123			

THE DISTRIBUTION OF THE NUTRITIONAL INTAKE OF 861 PEOPLE AT TRAVIS AFB

BAS-WHO DO NOT RESIDE IN THE BARRACKS

		COST FOOD ENY		PROTEIN		FAT		CALCIUM		IRON		VIT.A.		THIAMIN		RIBOFLVN		NIACIN		ASC.ACID	
		SMPL	PCT	SMPL	PCT	SMPL	PCT	SMPL	PCT	SMPL	PCT	SMPL	PCT	SMPL	PCT	SMPL	PCT	SMPL	PCT	SMPL	PCT
ATT																					
0- C PCT	403	403	82.2	403	82.2	403	82.2	403	82.2	403	82.2	403	82.2	403	82.2	403	82.2	403	82.2	404	82.4
0- 5 PCT	55	51	10.4	50	10.2	28	5.7	48	9.8	20	4.1	30	7.4	42	8.6	51	10.4	31	6.3	46	9.4
5- 10 PCT	23	21	4.3	21	4.3	21	4.3	20	4.1	23	4.7	16	3.3	20	4.1	17	3.5	23	4.7	20	4.1
10- 15 PCT	5	10	2.0	11	2.2	14	2.9	12	2.4	9	1.8	14	2.9	9	1.8	11	2.2	10	2.0	11	2.2
15- 20 PCT	3	2	.4	1	.2	10	2.0	3	.6	13	2.7	9	1.8	9	1.8	3	.6	9	1.8	6	1.2
20- 25 PCT	1	2	.4	3	.6	5	1.0	1	.2	7	1.4	5	1.0	3	.6	3	.6	9	1.8	1	.2
25- 30 PCT	0	0	0	0	0	4	.8	2	.4	5	1.0	3	.6	1	.2	1	.2	0	.0	2	.4
30- 35 PCT	0	1	.2	1	.2	2	.4	0	0	5	1.0	0	0	0	0	0	0	1	.2	0	.0
35- 40 PCT	0	0	0	0	0	2	.4	1	.2	0	0	1	.2	0	0	0	0	0	0	0	.0
40- 45 PCT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	.2	1	.2
45- 50 PCT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
50- 55 PCT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
55- 60 PCT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
60- 65 PCT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
65- 70 PCT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
70- 75 PCT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
75- 80 PCT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
80- 85 PCT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
85- 90 PCT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
90- 95 PCT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
95-100 PCT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
100-999 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
VARIANCE		.0	12661.0	.25.0	29.9	4292.1	.5	56036.7	.0	.7	19.5										
STD DEV		.065	112.521	5.915	5.467	65.514	.710	236.721	.066	.118	.855	4.413									
MEAN-OVERALL		.021	27.121	2.210	1.729	20.889	.237	72.039	.020	.038	.263	1.351									
COND-MEAN-USERS		.119	209.195	11.322	9.739	117.648	1.333	405.735	.115	.216	1.594	7.678									
SAMPLE		490	490	490	490	490	490	490	490	490	490	490									

THE DISTRIBUTION OF THE NUTRITIONAL INTAKE OF 861 PEOPLE AT TRAVIS AFB

USERS-WHO EAT THREE MEALS OR MORE

COST FOOD FNY			PROTEIN			FAT			CALCIUM			IRON			VIT.A.			THIAMIN RIBOFLVN			NIACIN ASC.ACID		
ATT	SMPL	PCT	SMPL	PCT	SMPL	PCT	SMPL	PCT	SMPL	PCT	SMPL	PCT	SMPL	PCT	SMPL	PCT	SMPL	PCT	SMPL	PCT	SMPL	PCT	
0- 5 PCT	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0	
0- 5 PCT	5	1.9	3	1.2	0	.0	2	.8	0	.0	1	.4	2	.9	38	14.7	45	17.4	2	.8	3	1.2	
5- 10 PCT	53	20.5	50	19.4	10	3.9	49	19.0	4	1.6	16	6.2	38	14.7	30	11.6	27	10.5	13	5.0	38	14.7	
5- 10 PCT	54	20.5	50	19.4	10	3.9	49	19.0	4	1.6	16	6.2	38	14.7	30	11.6	27	10.5	13	5.0	38	14.7	
10- 15 PCT	35	13.6	37	14.3	24	9.3	39	15.1	14	5.4	32	12.4	31	12.0	30	11.6	24	9.3	34	13.2	24	9.3	
10- 15 PCT	38	13.6	37	14.3	24	9.3	39	15.1	14	5.4	32	12.4	31	12.0	30	11.6	24	9.3	34	13.2	24	9.3	
15- 20 PCT	29	11.2	29	11.2	25	9.7	29	11.2	21	8.1	28	10.9	33	12.8	35	13.6	24	9.3	34	13.2	24	9.3	
15- 20 PCT	25	11.2	29	11.2	25	9.7	29	11.2	21	8.1	28	10.9	33	12.8	35	13.6	24	9.3	34	13.2	24	9.3	
20- 25 PCT	21	8.1	20	7.8	21	8.1	17	6.6	23	8.9	23	8.9	24	9.3	21	8.1	29	11.2	22	8.5	18	7.0	
20- 25 PCT	17	8.1	20	7.8	21	8.1	17	6.6	23	8.9	23	8.9	24	9.3	21	8.1	29	11.2	22	8.5	18	7.0	
25- 30 PCT	17	6.6	19	7.4	19	7.4	21	8.1	13	5.0	18	7.0	16	6.2	15	5.8	12	4.7	17	6.6	16	6.2	
25- 30 PCT	19	6.6	19	7.4	19	7.4	21	8.1	13	5.0	18	7.0	16	6.2	15	5.8	12	4.7	17	6.6	16	6.2	
30- 35 PCT	25	19	7.4	11	4.3	13	5.0	19	7.0	17	6.6	15	5.8	18	7.0	14	5.4	14	5.4	14	5.4	12	4.7
30- 35 PCT	19	7.4	11	4.3	13	5.0	19	7.0	17	6.6	15	5.8	18	7.0	14	5.4	14	5.4	14	5.4	14	5.4	
35- 40 PCT	17	7.4	29	11.2	14	5.4	22	8.5	11	4.3	8	3.1	14	5.4	19	7.4	14	5.4	14	5.4	14	5.4	
35- 40 PCT	17	7.4	29	11.2	14	5.4	22	8.5	11	4.3	8	3.1	14	5.4	19	7.4	14	5.4	14	5.4	14	5.4	
40- 45 PCT	16	5.4	12	4.7	8	3.1	12	4.7	9	3.5	13	5.0	14	5.4	20	7.8	14	5.4	14	5.4	14	5.4	
40- 45 PCT	16	5.4	12	4.7	8	3.1	12	4.7	9	3.5	13	5.0	14	5.4	20	7.8	14	5.4	14	5.4	14	5.4	
45- 50 PCT	14	5.4	12	4.7	16	6.2	17	6.6	13	5.0	15	5.8	12	4.7	15	5.8	9	3.5	13	5.0	10	3.9	
45- 50 PCT	14	5.4	12	4.7	16	6.2	17	6.6	13	5.0	15	5.8	12	4.7	15	5.8	9	3.5	13	5.0	10	3.9	
50- 55 PCT	9	3.5	17	6.6	4	1.6	12	4.7	11	4.3	14	5.4	14	5.4	14	5.4	13	5.0	12	4.7	7	2.7	
50- 55 PCT	9	3.5	17	6.6	4	1.6	12	4.7	11	4.3	14	5.4	14	5.4	14	5.4	13	5.0	12	4.7	7	2.7	
55- 60 PCT	7	3.9	8	3.1	14	5.4	9	3.5	9	3.5	13	5.0	11	4.3	10	3.9	11	4.3	9	3.5	9	3.5	
55- 60 PCT	7	3.9	8	3.1	14	5.4	9	3.5	9	3.5	13	5.0	11	4.3	10	3.9	11	4.3	9	3.5	9	3.5	
60- 65 PCT	3	1.6	2	.8	10	3.9	2	.3	11	4.3	11	4.3	7	2.7	4	1.6	10	3.9	15	5.8	6	2.3	
60- 65 PCT	3	1.6	2	.8	10	3.9	2	.3	11	4.3	11	4.3	7	2.7	4	1.6	10	3.9	15	5.8	6	2.3	
65- 70 PCT	0	3	1.2	3	1.2	13	5.0	3	1.2	5	1.9	9	3.5	5	1.9	2	.8	14	5.4	5	1.9	8	3.1
65- 70 PCT	0	3	1.2	3	1.2	13	5.0	3	1.2	5	1.9	9	3.5	5	1.9	2	.8	14	5.4	5	1.9	8	3.1
70- 75 PCT	1	4	1.6	3	1.2	11	4.3	2	.8	9	3.5	9	3.5	5	1.9	2	.8	14	5.4	5	1.9	8	3.1
70- 75 PCT	1	4	1.6	3	1.2	11	4.3	2	.8	9	3.5	9	3.5	5	1.9	2	.8	14	5.4	5	1.9	8	3.1
75- 80 PCT	0	1	.4	2	.8	4	1.6	2	.8	10	3.9	9	3.5	5	1.9	3	1.2	6	2.3	4	1.6	6	2.3
75- 80 PCT	0	1	.4	2	.8	4	1.6	2	.8	10	3.9	9	3.5	5	1.9	3	1.2	6	2.3	4	1.6	6	2.3
80- 85 PCT	0	0	0	0	13	5.0	2	.8	8	3.1	8	3.1	2	.8	4	1.6	5	1.9	1	.4	13	5.0	
80- 85 PCT	0	0	0	0	13	5.0	2	.8	8	3.1	8	3.1	2	.8	4	1.6	5	1.9	1	.4	13	5.0	
85- 90 PCT	0	1	.4	1	.4	7	2.7	0	.0	7	2.7	2	.8	0	.0	0	.0	10	3.9	3	1.2	10	3.9
85- 90 PCT	0	1	.4	1	.4	7	2.7	0	.0	7	2.7	2	.8	0	.0	0	.0	10	3.9	3	1.2	10	3.9
90- 95 PCT	0	0	0	0	7	2.7	0	.0	4	1.6	3	1.2	0	.0	0	.0	7	2.7	2	.8	6	2.3	
90- 95 PCT	0	0	0	0	7	2.7	0	.0	4	1.6	3	1.2	0	.0	0	.0	7	2.7	2	.8	6	2.3	
95- 100 PCT	0	0	0	0	5	1.9	0	.0	9	3.5	2	.8	0	.0	0	.0	3	1.2	0	.0	8	3.1	
95- 100 PCT	0	0	0	0	5	1.9	0	.0	9	3.5	2	.8	0	.0	0	.0	3	1.2	0	.0	8	3.1	
100-999 PCT	0	0	0	0	20	7.8	0	.0	50	19.4	9	3.5	1	.4	0	.0	11	4.3	2	.8	45	17.4	
100-999 PCT	0	0	0	0	20	7.8	0	.0	50	19.4	9	3.5	1	.4	0	.0	11	4.3	2	.8	45	17.4	
VARIANCE		.1	37506.7	1072.0		743.8	103994.8		14.51077237.2		.1	.4								25.2		605.0	
STD DEV		.363	612.422	32.741		27.273	322.482		3.802	1037.900		.328		.604						5.022		24.597	
MEAN-OVERALL		.556	920.037	49.190		41.117	486.199		5.695	1573.969		.497		.908						7.363		35.425	
CUMUL-MEAN-USERS		.427	706.457	37.771		31.572	373.332		4.373	1208.584		.382		.697						5.654		27.201	
SAMPLE		258	258	258		258	258		258	258		258		258						258		258	

USERS-WHO EAT NINE MEALS OR MORE

44